

SPECIATION

SBI3U



SPECIATION

- Speciation is the changing of individuals within a population so they are no longer part of the same species (i.e. they have evolved into a new species).
- Individuals are members of the same species when they can reproduce with each other to produce fertile offspring
- Speciation occurs when individuals of the same parent population can no longer reproduce with each other to produce fertile offspring



WHAT IS A SPECIES?

- Members of interbreeding groups or populations that are “reproductively isolated” from other groups
- There are two categories of isolating mechanisms
 - 1) Prezygotic
 - a) Ecological Isolation
 - b) Temporal Isolation
 - c) Behavioural Isolation
 - d) Mechanical Isolation
 - 2) Postzygotic



PREZYGOTIC ISOLATION MECHANISMS

- Prevent interspecies mating and fertilization
- This most often occurs due to geographic isolation or reproductive isolation of individuals within the population.
- As the species evolve and branch off, they cannot interbreed with members of the original species any longer.



PREZYGOTIC ISOLATION MECHANISMS

a) Ecological (or Geographical) Isolation:

- Two animals live in different habitats or locations; no chance of mating

Example: Ground hogs live in fields at lower elevation, while marmots live in alpine meadows.



PREZYGOTIC ISOLATION MECHANISMS

b) Temporal Isolation:

- Time of mating cycle; two species have a different mating cycles

Example: Similar plant species may bloom at different times of the day (day vs. night - cacti) or different seasons (spring blooming vs. summer blooming - irises)



Hylocereus undatus



PREZYGOTIC ISOLATION MECHANISMS

c) Behavioural Isolation:

- Two different species may have different mating songs and/or dances.
- Females of different species so not respond to signals
- Example: Spiders and Birds

[Jumping Spiders Video](#)



PREZYGOTIC ISOLATION MECHANISMS

- d) Mechanical Isolation: Reproductive Structures are mechanically incompatible

Gametic Isolation:

- Sperm and egg cell are unable to fuse properly, therefore no zygote is formed

Example: Complex penis shape of various arthropod species

Example: Giant clams release gametes into water

[Barnacles Video](#)



POSTZYGOTIC ISOLATION MECHANISMS

- Prevents maturation and reproduction in interspecies offspring
 - a) Zygotic Mortality: chromosomal abnormalities prevent embryo from developing
 - b) Hybrid In viability: Hybrid offspring don't live long enough to reproduce
 - c) Hybrid Infertility: offspring may be strong but sterile
Example: Horse (Female) + Donkey (male) = Mule



Figure 5
Mules are bred from a female horse and male donkey.



MODES OF SPECIATION

Any series of events that result in the reproductive isolation of two populations may also lead to the formation of new species

1) Allopatric separation

- Evolution of a new species due to a physical barrier preventing gene flow.
- Also need a different selective pressure. The barrier alone will not produce a new species.

Example: river or canyon blocks small rodents

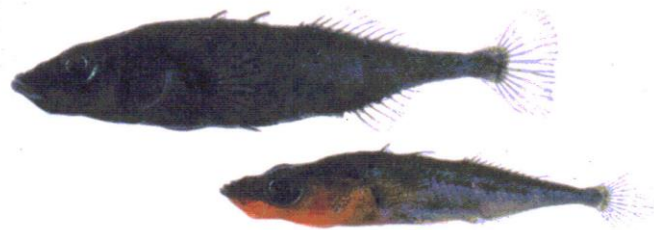
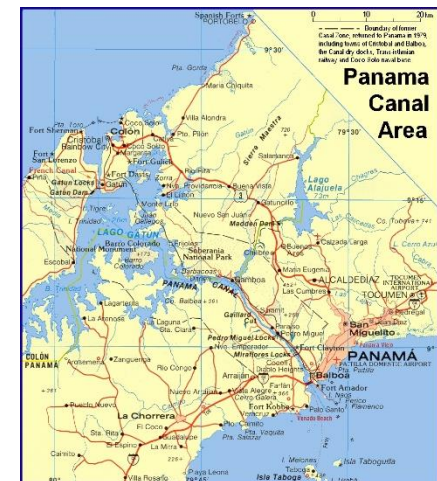


Figure 8

Evidence strongly suggests that a number of species of sticklebacks evolved by sympatric speciation.



2) Sympatric Speciation

- The evolution of populations within the same geographic area into separate species.
- New species created with **no** physical barrier.

Example: two species of tree frog whose territories overlap have a very similar genetic code. One founder group mutated and double their genes → can't mate anymore



Figure 1

Two species of grey tree frogs, *Hyla versicolor* and *Hyla chrysoscelis*, cannot be distinguished by their appearance but can be differentiated by their mating calls. The trill rate of the *H. versicolor* ranges from 17 to 35 notes per second compared to the trill rate of the *H. chrysoscelis* at 34 to 69 notes per second.

